Henry Ford Hospital Medical Bulletin

Vol. 1 June, 1953 No. 2

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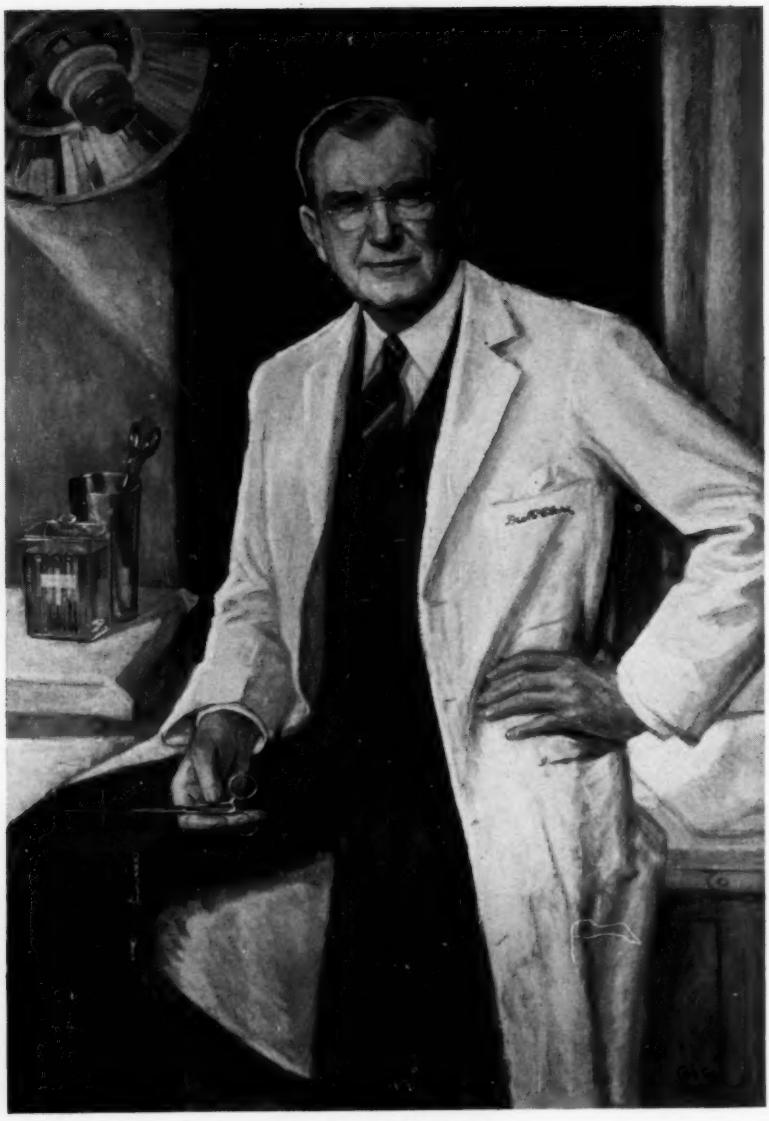

DR. ROY D. McCLURE
1882-1951
Surgeon-in-Chief 1917-1951

IODIZED SALT FOR THE PREVENTION OF GOITER A LIFELONG INTEREST OF DR. ROY D. McCLURE

BROCK E. BRUSH*

Chairman Iodized Salt Committee

Michigan State Medical Society

The State of Michigan, situated as it is in the Great Lakes endemic goiter belt, offers an unusual opportunity for the study of the disease and the effects on its incidence of iodized salt used as a prophylactic measure. This challenge was accepted by the Michigan State Medical Society and the Michigan Department of Health thirty years ago, and the story of their accomplishments in goiter prophylaxis since that time is comparable to the classical discoveries of preventive medicine in many other fields. A review of their experience clearly shows that endemic goiter is truly one of the easiest known diseases to prevent.

In 1812, Courtois of France isolated the element iodine and described its unusual color and vapors. It was soon recommended for the treatment of goiter and Switzerland used iodized salt as a prophylactic measure as early as 1840. Chatin,[1] in 1850, showed the iodine content of the soil and water to be low in goiter areas and noted also that goiter was improved by sea sponge ash, and in 1896 Bauman[2] discovered that iodine was concentrated in the thyroid gland.

The work of Marine[3] and his associates begun in the year 1907 in the study of goiter and its relation to iodine marks the beginning of the newer and more practical knowledge of this relationship. They showed that when brook trout were maintained without iodine, goiter invariably developed and that the addition of a small amount of iodine to the water caused the goiters to decrease in size. This was shown to be true also in the case of cattle, sheep, pigs and other animals.

Marine[4] (1928) as a result of his studies believed that goiter is a compensatory hypertrophy of the thyroid gland resulting from a relative or absolute deficiency of iodine. This deficiency of iodine may be due to: (1) factors which bring about an abnormally low intake of iodine; (2) factors which interfere with absorption or utilization of an otherwise adequate intake; (3) factors which increase the needs of the body for the iodine containing hormone. The chief factor under 1 is the lack of iodine in the food and water supply. Factors under 2 are becoming better known as the complex inter-relationship of the glands of internal secretion is becoming better understood. Under 3, it is well known that the thyroid is prone to enlarge at puberty, during menstruation, during pregnancies and with certain infections. Enlargement in these instances may demonstrate the need for more thyroxin when an inadequate supply of iodine for its manufacture is available.

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*Senior Associate in Division of General Surgery. Iodized Salt Committee, Michigan State Medical Society, Chairman.

ENDEMIC GOITER STUDIES IN MICHIGAN

The studies of endemic goiter in Michigan[5] begun in 1923, have been a co-operative effort of the Michigan State Medical Society and the Michigan Department of Health with the guidance of Dr. O. P. Kimball and the co-operation of salt manufacturers and wholesale and retail grocers. The Medical Society has had an iodized salt committee for the purpose of continuous study of the problem and the early work of Drs. D. M. Cowie, Roy D. McClure, O. P. Kimball, C. C. Slemons, R. M. Olin and H. Towsley is noteworthy.

In 1923, a survey of ground water supplies in Michigan was made to determine their iodine content. On the basis of the findings of this survey, four counties were chosen for study. These counties showed the greatest differences in iodine content of their ground waters and were considered representative of a cross-section of the population of the state. They were Houghton, Wexford, Midland and Macomb Counties, located on a line running diagonally from the northwest to the southeast corners of the state.

Fig. 1—Four Counties chosen for survey.

The total number of boys and girls examined in the four counties was 31,612. Of these, 14,914 (47.2 per cent) showed goiter (Table I). While the incidence was high in all counties, it was greatest in Houghton County (64.4 per 100 examined) and least in Macomb County (26 per 100 examined).

The results of the survey showed beyond a doubt that there was a correlation between a lack of food iodine and the incidence of simple goiter, as the goiter incidence was inversely proportional to the iodine content of the ground water supply in the areas studied.

At the completion of the survey, a program of goiter prevention was undertaken by the State Medical Society and the State Department of Health. Iodized salt was selected as the medium of correcting the iodine deficiency because it was felt that a household necessity like salt would solve the problem for both urban and rural areas. The co-operation of the Salt Manufacturers Association was enlisted and the iodized salt committee of the State Medical Society worked with them on the many technical problems involved in manufacturing an iodized salt acceptable from the standpoints of content, stability and cost.

In the resurveys in 1928, 1935 and 1951, information was also obtained as to whether the children had been using iodized salt regularly, irregularly or not at all.

The resurveys in 1928 and 1935 showed a remarkable reduction in goiter among those using iodized salt with an over-all reduction of the incidence from 38.6 per cent to 8.2 per cent. In those who had used iodized salt the incidence was reduced to between 2 and 3 per cent, while in the group who had not used it the incidence remained at from 25 to 35 per cent. A valuable study was possible in the mining town of Calumet where in 1932-35 during the depression two-thirds of the families were on relief and used non-iodized bag salt. There was an increase of 43 per cent in the number of goiters.

In 1951, the school children in the same four counties (Houghton, Wexford, Midland and Macomb) were examined for abnormal enlargement of the thyroid gland. This was a co-operative activity between the goiter committee of the Michigan State Medical Society and the Michigan Department of Health. Six physicians, again using standardized criteria, examined 53,785 pupils. The results of these examinations showed 1.4 per cent (787) with abnormal enlargement of the thyroid. This varied from 8.3 per cent in Houghton County to 0.2 per cent in Midland County.

TABLE I. THYROID AND SALT SURVEYS
Houghton, Wexford, Midland and Macomb Counties 1924 and 1951

County	Thyroid Survey					
	Total Examined		Abnormal Thyroids			
			1924		1951	
	1924	1951	No.	%	No.	%
Houghton	13,723	6,930	8,835	64.4	575	8.3
Wexford	3,984	3,811	2,216	55.6	13	0.3
Midland	3,645	8,751	1,191	32.7	17	0.2
Macomb	10,258	34,293	2,672	26.0	182	0.5
Total (4 counties)	31,612	53,785	14,914	47.2	787	1.4

The results of the studies in Wexford County are shown in Fig. 2, and the results of the 1924 and 1951 surveys are shown in Table 1.

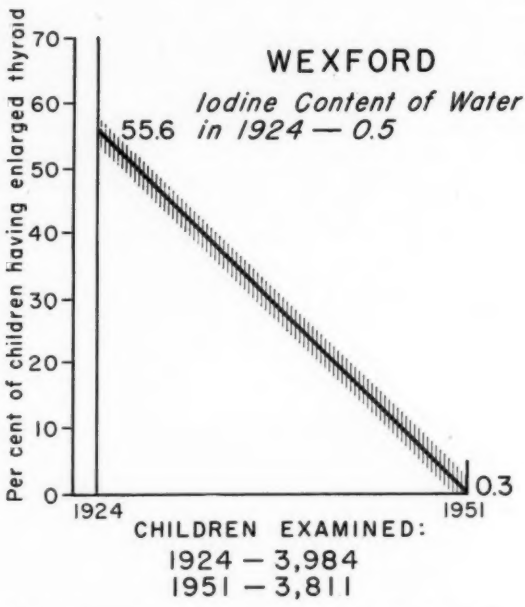

Fig. 2—Comparative Incidence of Goiter in Wexford County Before and After the Introduction of Iodized Salt.

DISCUSSION

The fact should be emphasized that at no time has there been a law in Michigan requiring that all salt sold be iodized. The Michigan Department of Health and the Michigan State Medical Society have carried on a program of education and advice in the form of news articles, radio programs, placards, pamphlets and health talks. Experience has shown that unless this problem is kept continually before the people there is a great tendency for the sale of iodized salt to decrease. The survey of grocery stores indicated that iodized salt is not always displayed prominently and in some instances has to be especially ordered. This problem has been met in Switzerland and Canada by having all table salt enriched with iodine. The report of J. F. McClendon[6] showed the remarkable results of goiter prophylaxis with iodized salt in Switzerland.

Curtis and Firtman[7] have performed iodine balance studies and as a result of these the Food and Nutrition Board of the National Research Council gives the daily requirement of iodine for an adult as 0.15 to 0.30 milligrams. Iodized salt meets this requirement and is especially important in adolescence and during pregnancy.

No ill effects have been noted from the use of iodized salt. The small amount of iodine used has not, according to the American Dermatological Society, caused any difficulty in those with a tendency to acne, an objection which was once raised. The stabilizers used by the manufacturers insure a uniform mixing of the iodine, and the Canners' Association has stated that there is no disadvantage in using iodized salt in all types of food canning.

Arnold Jackson[8] in 1926 stated that "simple adenoma is one form of endemic goiter which closely follows colloid goiter in regional distribution. The incidence of adenoma of the thyroid is decreased by the prophylactic treatment of colloid goiter."

Levin,[9] using draft board statistics, has shown that the incidence of exophthalmic goiter throughout the United States is proportional in every locality to the incidence of endemic goiter. McClure[10] reported that since the introduction of iodized salt in Michigan coincident with the great dropping off in the number of enlarged thyroids there has been a dropping off in the number of operations for hyperplasia and adenomata of the thyroid in seven large Michigan hospitals.

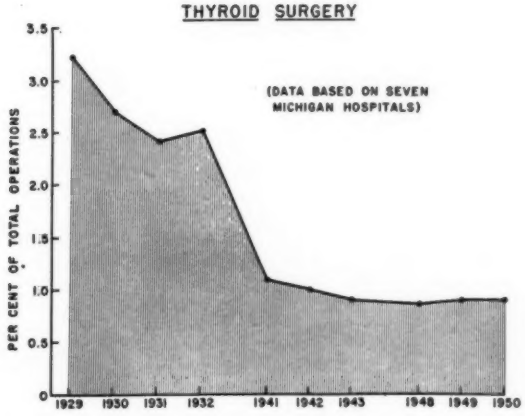

Fig. 3—Decreased Incidence of Major Thyroid Surgery 1929 to 1951 in Seven Representative Michigan Hospitals.

Roy D. McClure, M.D. was one of the early pioneers in this work, being a member of the Iodized Salt Committee of the State Medical Society since its inception, and Chairman of the committee for 10 year prior to his death.

W. H. Sebrell,[11] Director of the National Institutes of Health, has cited surveys made by the Public Health Service which show that goiter is quite prevalent in areas outside the so-called "goiter belt"—"In Mitchell County, Georgia, 31 per cent of women had an enlarged thyroid gland and in Alachua County, Florida, 25.6 per cent of the negro females between 13-20 years of age were affected."

Natural salt deposits contain varying amounts of iodine. An incidence of conversion from a nongoiter area to a goiter area occurred in the Kanawha River Valley of West Virginia. Kimball[12] reported that prior to 1900 a local crude, coarse, brown salt was used and goiter was exceedingly rare. After this, a sparkling white salt containing no iodine was shipped in and preferred. The goiter rate rose sharply and in 1922 a survey showed that 60 per cent of adolescent girls in the valley had goiter.

It is well known that there are present in some areas certain goitrogenic agents, such as are present in cabbage and other vegetables. Webster and Chesney[13] and Helwig[14] have shown that when additional iodine is given to rabbits receiving an otherwise goitrogenic diet, goiter does not develop.

The wide use of an enriched block salt by stock farmers has undoubtedly been a factor in some of these essential elements finding their way into the food and thus has helped reduce the incidence of endemic goiter.

CONCLUSIONS

1. Endemic goiter has become practically non-existent in Michigan since iodized salt was put on sale in 1924.

2. Salt can be iodized accurately, efficiently and inexpensively.

3. Experience in Michigan indicates that no ill effects result from the use of iodized salt.

4. Experience in Michigan also indicates that toxic nodular goiter and diffuse goiter are less apt to occur when there has been no previous enlargement of the gland as occurs in endemic goiter.

5. It is essential that departments of health and medical societies continually remind the public of the importance of this prophylactic measure.

ACKNOWLEDGMENT

Acknowledgment is gratefully made to the Michigan Department of Health, who conducted these surveys, and especially to Dr. J. R. Altland who has directed this work.

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THE BILLROTH I GASTRECTOMY

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It is of historical interest that the operation of partial gastrectomy antedates that of gastro-enterostomy. In 1881 Theodor Billroth removed the pyloric segment of the stomach for carcinoma. Gastrointestinal continuity was restored by anastomosing the end of the stomach directly to the duodenum. In the same year, in which this first successful partial gastrectomy was performed, Billroth's assistant, Anton Wolfler, seeking to emulate his master, was operating on a patient with carcinoma of the pyloric end of the stomach. He found it technically impossible to remove the lesion, and was about to close the abdomen when his assistant, Nicoladoni, suggested short circuiting the tumor by anastomosing the upper jejunum to the stomach, proximal to the tumor. Thus Wolfler performed the first gastro-jejunostomy.

The first partial gastrectomy was of the type known as Billroth I, that is, direct anastomosis of the end of the stomach to the end of the duodenum. Certain difficulties arose in the practice of this operation, due principally to the inequality of the lumen of the structures to be united. Many modifications of the original Billroth I procedure were adopted by Billroth and his contemporaries, the principal modification being that of closing a portion of the lower end of the stomach so that the opening approximated the caliber of the duodenum and allowed for a more careful approximation by direct end to end anastomosis. Like the solutions of many problems this brought with it a problem of its own, namely, a three point angle of suture was produced at the superior border of the duodenum. It was here that the difficulties with healing of the anastomosis developed. The earlier German literature on the subject contains many references to this fatal angle or "angle of sorrows," so-called because of the number of anastomotic failures. It was not until 1885 that Billroth himself conceived the idea of utilizing the jejunum for the anastomosis rather than the duodenum after removal of the lower end of the stomach. This procedure, known as the Billroth II operation, very quickly received universal acceptance because of its safety factor, since an end to side anastomosis is always more secure than an end to end anastomosis. The popularity of this operation is attested by the fact that some forty modifications of the original procedure have been introduced. All went well with the Billroth II operation until partial gastrectomy was adopted for the treatment of the duodenal ulcer. However, as accumulated case records began to be published it soon became evident that a definite number of patients developed jejunal or marginal ulcers after gastric resection. The prevention of jejunal or marginal ulcer is, therefore, one of the great problems of the gastrectomist at the present time. Since this complication develops in patients with high acid values, more and more of the stomach has been resected in an endeavor to avoid the development of jejunal ulcer and while it may be said that the incidence of jejunal ulcer is less in patients with a high gastrectomy than in those who have a minimal, or

subtotal operation, there is still a definite number of patients who develop jejunal ulcer even after adequate resection. The removal of increasing amounts of stomach, in its turn, has lead to the development of other complications, such as nutritional deficiences, and the appearance of the so-called dumping syndrome. At the Henry Ford Hospital we have attempted to solve this problem by the addition of vagotomy to the operation of partial gastrectomy, and by utilizing the Billroth I procedure as frequently as possible. It is, of course, manifestly impossible for a patient to develop a jejunal ulcer after subtotal gastrectomy performed with the Billroth I technique, although a new duodenal ulcer, or marginal ulcer may appear. The Billroth I operation, as performed at this hospital, is a modification of Billroth's original procedure and might more properly be called the Billroth I–Schoemaker procedure, since it employs the modification of tubing of the stomach suggested by Schoemaker. The principle here involved is complete mobilization of the stomach by sectioning the left gastric artery at its point of origin and removal of the entire lesser curvature. When the stomach is closed after removal of the lesser curvature a tube-like elongation of the stomach is produced so that the caliber of the end of the stomach roughly approximates that of the duodenum. In this fashion a safe direct anastomosis can be made without tension. The keynote of the Billroth I operation is mobilization of the duodenum and this means not only mobilization of the duodenum, but mobilization of the head of the pancreas. If attention is directed to mobilizing the head of the pancreas, rather than the duodenum itself, the mobilized head of the pancreas brings the duodenum over toward the mid line. The secret of this manoeuver lies not only in cutting the peritoneum along the greater curvature of the duodenum, but also in cutting the fascia propria which binds the head of the pancreas to the posterior abdominal wall. In this fashion the duodenum can be easily and thoroughly mobilized. The advantage and importance of this manoeuver cannot be overemphasized. Moreover, section of the vagus nerves increases the mobilization of the stomach and several centimeters in length of the gastric stump is produced. In this manner the basic principle of all gastrointestinal surgery, namely, that of adequate mobilization and suture without tension is maintained. Thus the operation can be performed as safely in the majority of instances as the Billroth II procedure. In certain cases scarring of the duodenum, retraction of the duodenal cap, and ulceration in the proximal duodenum, render the situation impossible for direct anastomosis of the end of the stomach to the end of the duodenum. Under these circumstances the modification of Finney and von Haberer is introduced, namely, that of closing the end of the duodenum and making the anastomosis between the end of the stomach and the side of the descending duodenum. This is simply a modification of the Billroth I procedure and is, in fact, the only manner in which the direct duodenal anastomosis can be made in many cases of duodenal ulcer. The Billroth I operation cannot be utilized in all patients. It is our policy to mobilize the stomach and fashion the gastric tube before making a decision as to whether or not to apply the Billroth I procedure. If the structures can be anastomosed without tension, then we proceed with the Billroth I operation. If there is any contraindication, we do not hestitate to carry out a routine Billroth II operation.

The rationale of the Billroth I operation may be cited, as follows:

1. Anatomic—The normal anatomic relationship is restored.

2. Physiologic—Gastric contents after operation are poured into the duodenum, an organ accustomed to receiving acid secretion and, theoretically at least, better adapted for this purpose than the jejunum.

3. Technical—(a) The entire operation is performed in the supracolic compartment, a fact of definite value when dealing with substandard patients and when the procedure must be carried out under local anesthesia, since disturbance of the colon, mesocolon and small intestine is avoided. (b) The duodenal stump should be more secure, since back pressure on this area is impossible. (c) Postoperative gastric retention due to mechanical kinking at the stoma does not occur.

The following objections have been raised: 1. The operation technically is more difficult than gastro-jejunostomy. 2. Insufficient stomach is resected. This objection is invalidated if the duodenum and stomach are adequately mobilized and the decision to utilize the operation is not made until after the resection is accomplished. 3. Reflux of beneficial alkaline duodenal contents into the stomach is less than after gastro-jejunostomy. Continuous postoperative gastric aspiration in comparable groups of patients has shown that there is no appreciable difference in the amount of duodenal contents removed. 4. Complete mobilization of the duodenum increases the tendency to duodenal ileus. This did not occur in any of our patients.

COMMENT AND PERSONAL EXPERIENCE

My interest in this type of anastomosis was first aroused by its employment in the treatment of jejunal ulceration following gastro-jejunostomy and recurrent jejunal ulceration after adequate subtotal gastrectomy. Later, in performing gastrectomy under local anesthesia in patients with massive hemorrhage and other substandard patients its advantages were again apparent, because the operative procedure could be carried out entirely in the supracolic compartment. On the basis of an encouraging beginning the scope of the operation has been extended gradually until approximately two-thirds of the gastrectomies are now done according to the method described in the foregoing. This operation has now been performed in this hospital on approximately two hundred patients. Dr. James Baltz of the Division of Gastro-Enterology has recently completed a study of sixty-eight of these patients followed for a period of from three to five years after operation and, in this group, has been able to unearth only one suspected example of marginal ulcer. In an equal number of patients following gastro-jejunostomy the incidence of jejunal or marginal ulceration is more than seven per cent. This encouraging figure has given us much impetus to continue with this type of combined operation, namely, Billroth I anastomosis plus vagotomy. At this time it is not clear that the Billroth I procedure alone has been responsible for the improvement. It may very well be that the addition of vagotomy is the actual factor of importance. Only time and much study will indicate the true and relative value of this operation. Meanwhile, the enthusiasm of all members of the General Surgical Staff for the procedure indicates the continuance of its use.

TUBE FEEDING WITH LIQUEFIED NATURAL FOODS

JAMES BARRON, M.D.*

The maintenance of nutrition, fluid and electrolyte balance is an ever present problem in medical as well as surgical patients. Even though in recent years most emphasis has been placed on the intravenous route, the superiority of alimentary ingestion is well recognized. There are always some patients who cannot, or will not, take food and fluid by mouth. In the past, the usual gastric or jejunal tube has been too poorly tolerated to be of any practical use. With the availability of fine caliber plastic tubes, we now have inexpensive, non-irritating tubes which can be tolerated in the upper gastro-intestinal tract over long periods of time. For some time now we have been using the polyethylene tube, size PE240 with an outside diameter of 2.4 mm. When introducing these tubes into the stomach, they may be cut about the same length as a Levine tube and simply passed through the nostril down into the stomach in the usual manner. However, if there is an obstruction, or fistula, in the upper gastro-intestinal tract, or if the patient is vomiting, special means must be used to pass this tube well down into the jejunum. These tubes may be passed into patients who cannot cooperate in swallowing, including unconscious patients. They may be passed in cases where one can get a length of silk, either alone or attached to a small balloon (with mercury) to pass through the obstructed area. After the string is in place, well down in the jejunum, the tube is simply threaded over the string and allowed to pass down into the small intestine. One should select the gastric route of administration in preference to the small intestine unless there is some definite reason to the contrary. The jejunal tubes have been of great help in many cases, including cases of delayed emptying following gastrectomy, biliary fistula, duodenal fistula, upper small bowel fistula, pancreatic fistula, vomiting, and other cases of this type. For details on the preparation and passage of these tubes, the reader is referred to a previous publication.[1] These polyethylene tubes may be used for replacing various body fluids, such as bile, water, gastric juice, duodenal secretions, pancreatic secretions, upper small bowel content, chemicals, water soluble drugs, feeding formula, and finally liquefied whole food. Some years were spent in developing various feeding formulas which would pass through this type of tube. In the majority of cases, with increasing experience, it was possible to use these feeding formulas[1]; however, we were still not completely satisfied. Accordingly, we devoted our efforts toward a more satisfactory food preparation. In using the prepared feeding formulas over long periods of time we became increasingly aware of the fact that the clinical results obtained were not entirely satisfactory. Many patients would develop various signs and symptoms of the lack of some important nutritional element in spite of all the materials that were placed in the formula. In view of this, our efforts were turned to a search for some method by which we could use whole food preparations as desired.

*Senior Associate in Division of General Surgery.

Increasing evidence stresses more and more the complexity of nutritional needs of the human body. From a few nutrients thought to be sufficient for a healthy cellular metabolism a generation ago, the number of factors now known to be necessary has increased greatly and undoubtedly in the future more will be discovered. There are few who will disagree with the statement that natural whole foods are to be preferred for nutritional purposes for after all these are what the body has been accustomed to for a long period of time. We know of no manufactured preparation at present which can surpass, or even equal, such natural foods as meat, vegetables (fresh or cooked), eggs, milk, fruits, etc. It is apparent that the gastro-intestinal tract should tolerate this as well, or better, than any prepared feeding formula. Here we have a good source of natural proteins, fats, carbohydrates, minerals, vitamins, and other necessary constituents. In following this up, we determined that a mechanical blender (such as a Waring) was quite satisfactory to liquefy whole food using water or milk, or fruit juice as the liquid along with the tray of whole food. In fact, the only things that have been removed are the bones and seeds. For about a year we used a Waring blender for liquefying whole trays of food with good success. We found that by not overloading the machine, adding adequate liquid (water, fruit juice, or homogenized milk), that we could quite satisfactorily prepare liquefied meals of any diet desired. We found that it was necessary to strain this material through wire gauze strainers, and in doing so we found that we would lose about 5 to 12% of the protein present. This was easily replaced by adding one or two eggs to each meal, which more than made up for the loss of protein. We found that this food was very well tolerated in the gastric feedings, and even well tolerated in the jejunal feedings as long as it was placed in the jejunum at a slow, constant rate. Clinical use of this material soon provided innumerable examples of its superiority of providing all essential nutrients in adequate quantity, simultaneously, and in a well tolerated form. We did find early in our experiments with liquefied whole food that some form of mechanical pump was almost a necessity, as it would supply the adequate pressure to force the food through the small tube; and it could be depended upon not to drip the food too fast or too slow. We began to search for a larger machine and one that would grind the food more adequately and, accordingly, we secured a colloid, or a serum mill, with a capacity of 5 gallons, from the Admiral Tool and Die Company, Long Island, New York, Fig. 1. This machine is ordinarily used in the chemical, cosmetic, and drug business. By means of a micrometer adjustment the particles may be ground practically as fine as one desires. The machine has a water jacket so that all heat generated is disposed of and it does not destroy the food. By using this machine one can quite easily add meat, vegetables, eggs, milk, fruit and any other natural foods that one cares to use in the diet. This machine has proven quite satisfactory and will grind the food into much smaller pieces than the small blenders. In using the food after it is delivered from the machine, we have simply placed the material in intravenous fluid bottles, or milk bottles. The liquefied food is placed in the ice box and is used as needed. We have found that adequate liquid has to be added to keep the material fluid enough to flow through these small tubes. We have found that the average meal can easily be prepared in 800 to 1000 cc, and that we would easily have 1000 to 1300 calories in one of these 1000 cc bottles. To use, the material

is simply shaken well and then poured through one medium wire gauze strainer. In passing through this practically no material is removed when the large colloid mill is used.

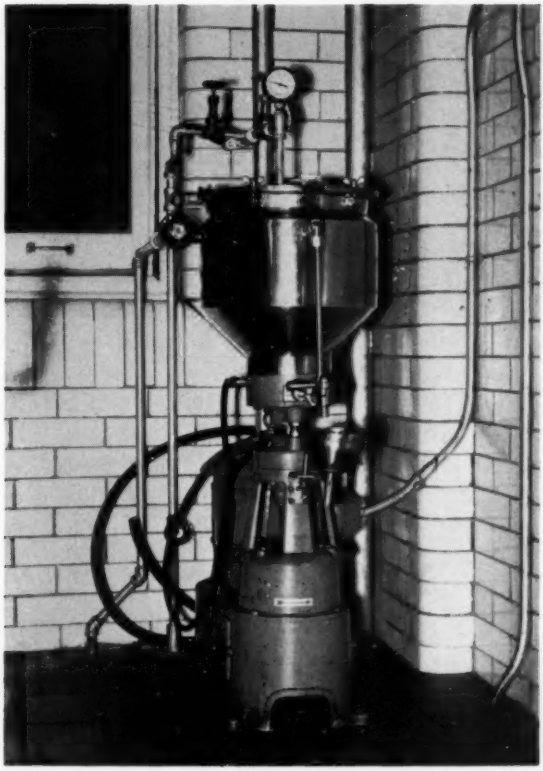

Fig. 1—Colloid Mill—made by Admiral Tool and Die Company —5 gallon capacity—water jacket for cooling. Steam connections for sterilization and cleaning. A micrometer adjustment is present so that the particle size can be regulated.

After many attempts, we have finally perfected a small feeding pump, which by using various geared motors can be made to deliver the food at almost any speed desired, Fig. 2. We have found for practical purposes that a machine which will deliver a liter in about 2 to 5 hours is the most satisfactory for all around use. We have made some machines which would deliver a liter in an hour, and some which will take as long as 10 hours. We have repeatedly noted that any material (including water) introduced directly into the jejunum must be at a slow rate; otherwise cramps and diarrhea result. We prefer to use pumps for jejunal tube feeding which will deliver a liter in 5 to 10 hours. These pumps will be described in detail in a later publication. At the present time the material cost on these pumps is well under $12.00. With the liquefied whole food we have been most

impressed with: first, the tolerance on the part of the patient; and second, the clinical response obtained. In fact, at the present time we are using no feeding formulas of any type, because the liquefied whole food, in our opinion, far surpasses that of any formula that we have used in the past.

In preparing food for a limited number of patients a mechanical blender (such as Waring, Oster, Universal, etc.) is satisfactory. In using this the precautions to follow are: First of all, the removal of all bones and seeds from the food; second, the use of homogenized milk, rather than whole milk, because butter will form from ordinary milk. It is of interest to note that ordinary milk may be used quite readily in the colloid mill. The blender should not be over-loaded. The blender container should only be about half full at each grinding. The machine should be allowed to run for at least five or ten minutes and adequate liquid must be added, whether this be milk (homogenized), water, or fruit juice. Patients, or members of the family, may be taught to use this machine readily for liquefying whole food. The colloid mill will make the food particles much smaller and, in general, is more satisfactory, especially for large numbers of patients. Although it is fairly expensive, the cost is more than justified in human lives saved and in the good clinical response noted. It must also be remembered that intravenous blood, fluid, and amino-acids are, at the best, only temporary and that the cost of these is almost prohibitive on any large scale use. In the past we have devoted most of our efforts toward feeding these people after surgery, and it is quite obvious that much good would be accomplished if we build these patients up prior to surgery. At the present time we are making a definite effort to feed the patients prior to surgery where a good deal of weight has been lost.

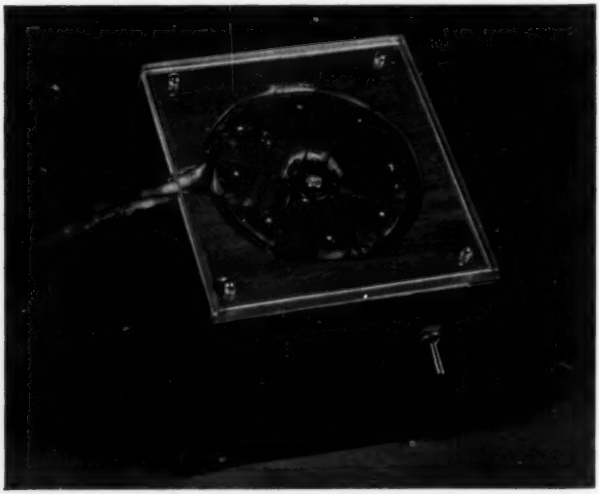

Fig. 2—Feeding Pump—The rubber tube is easily changed. There is no tendency for the tube to move. These are made with small gear motors.

Liquefied whole food has now been used in well over one hundred cases. These cases have included: duodenal fistula, delayed emptying after gastrectomy, oral surgery, carcinoma of pharynx and stomach, nephrosis and nephritis, cerebrovascular accidents, burns, brain tumors, biliary fistula, coma, high small intestinal fistula, partial upper gastro-intestinal obstruction, vomiting, anorexia, ulcerative colitis, swallowing problems, malnutrition, regional enteritis, diarrhea, and dumping syndrome after gastrectomy. We now have available a source of natural foods which are readily passed through small, non-irritating tubes in those patients who for some reason cannot take food and fluids by mouth. A technique has been developed for passing these small tubes into the stomach and jejunum. Small, inexpensive feeding pumps have been developed which will place this food in the upper gastro-intestinal tract at any rate desired. In our opinion, liquefied whole natural food surpasses any prepared feeding formula that we have used.

ACKNOWLEDGMENT

We would like to express our sincere appreciation to the many people who have given us much help and encouragement. Among these we would like to include:

Various members of the unit and main kitchens; staff of the maintenance department; purchasing department; general stores; dietary department and Mr. John Gensicki, who has given much technical assistance in developing the present feeding pump.

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THE ARTIFICIAL KIDNEY, A DESCRIPTION AND DISCUSSION OF THE MODIFICATION OF LEONARDS AND SKEGGS

A. Waite Bohne, M.D.* and
Paul J. Hettle, M.D.**

The use of the artificial kidney has been a recent development in the field of medicine and surgery, and has become a useful and life saving measure in many conditions. A description of the Leonards and Skeggs modification follows with a discussion of the principles, the indications, and some of the results.

1. *Dialysis*

Dialysis, the basis of all artificial kidneys in clinical use at the present time, is a process of "selective filtration."[1,2] Basically, this means that a membrane which permits substances up to a given molecular size to pass freely, is placed between the solution, e.g., blood, containing those substances for removal and another solution, the dialyzing solution, which has no such substances present or present in lesser concentrations.[2] The products to be removed will pass into the dialyzing solution until equilibrium is established. If, initially, the dialyzing solution contains none of the products for removal and is changed as the concentrations of these products rise during the procedure, one can accomplish almost complete removal of the products. Able, Roundtree, and Turner in 1912 were the first investigators to utilize this principle in the extracorporeal dialysis of living animals.[3,4]

Within certain limitations, the efficiency of dialysis is directly proportioned to the following:

(1) Concentration of the substance in the patient's blood.[5]
(2) Surface area of the membrane.[6,7]
(3) Hydrostatic pressure gradient.[8,7]
(4) Osmotic pressure gradient.
(5) Thinness of the membrane.[5]

2. *Leonards and Skeggs Dialyzer*[9]

The dialyzing mechanism of this "kidney" is made up of twelve units connected in parallel series. Each unit consists of two rectangular sheets of cellophane, the membranes, sandwiched between two rectangular, corrugated rubber sheets. The blood of the patient is caused to flow in at one end between the sheets of cellophane and the dialyzing solution to flow in at the opposite end between the cellophane and the rubber sheet. In this manner counter-current action is obtained and the efficiency increased.[8] The blood is propelled through the machine by a Beck pump, as is the dialyzing solution. A constant temperature is maintained by a thermostatic heating unit, through which the dialyzing solu-

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tion passes before entering the machine. Dialyzed blood leaves at the opposite end to entry and goes into an air trap before return to the patient.

The dialyzing surface area of each unit is 840 cm.^{2} and during operation each contains approximately 45 c. cms, of blood. The total membrane area is about twice as great as the filtering surface of two normal kidneys. Under optimum conditions approximately 0.5 gram of urea nitrogen per hour can be removed from dogs with a urea level of 150 mg percent.[10]

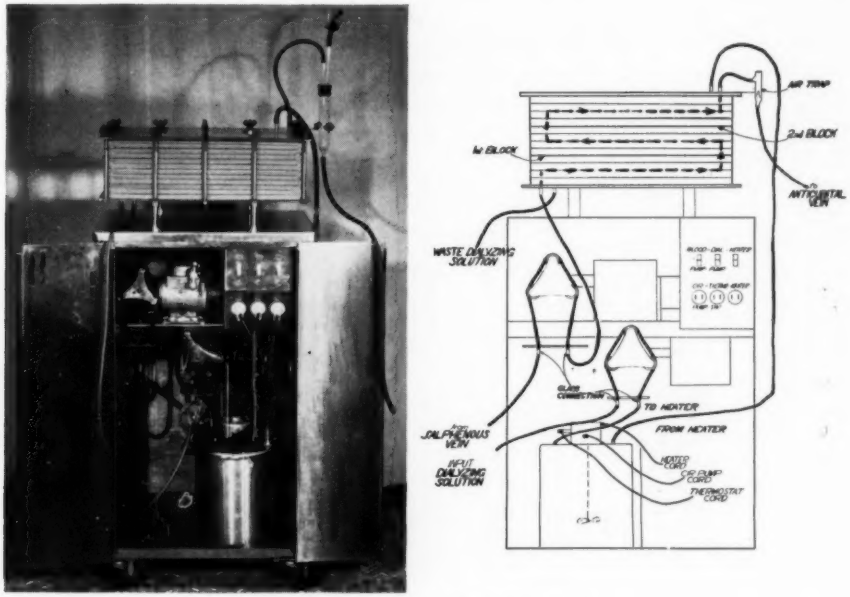

Fig. 1—Leonards and Skeggs Dialyser.

3. *Specific Problems Regarding Components of the Machine and its Utilization*

A. The Dialyzing Solution.

Most solutions are designed to have the same milli equivalents of electrolytes as normal plasma.[4, 11] Therefore, if the patient's blood is high or low in a particular substance, there will be a tendency toward restitution of normal level. However, if the primary purpose of dialysis is the removal of one substance, e.g., K^+, it theoretically would be advantageous to reduce that ion in the dialyzing solution, thereby effecting a more efficient transfer of potassium from the patient's blood.[12, 13, 14]

The pH of the solution is maintained at 7.3–7.45. If the pH varies greatly in either direction, untoward effects are noted in the patient, as would be seen clinically in acidosis or alkalosis.[7] Further, as a secondary change, hemolysis might be noted.[15]

The osmotic force exerted by the dialyzing solution should equal or surpass that of the patient's blood in order that edema not ensue from transfer of water.[16, 2]

Consequently, most solutions have a hypertonicity as regards glucose.[4, 17] During dialysis, however, the sugar passes the membrane readily and the blood sugar of the patient rises.[18, 19] With this rise, the osmotic gradient away from the patient is correspondingly decreased.[20] It is well to note that the urea, per se, in the patient's blood will affect the osmotic gradient and this factor is reduced as urea is dialyzed.[2] By measuring the osmotic activity of the patient's serum and comparing with that of the dialyzing solution, prior to dialysis, one is able to obviate the possibility of edema during the procedure.[2, 21]

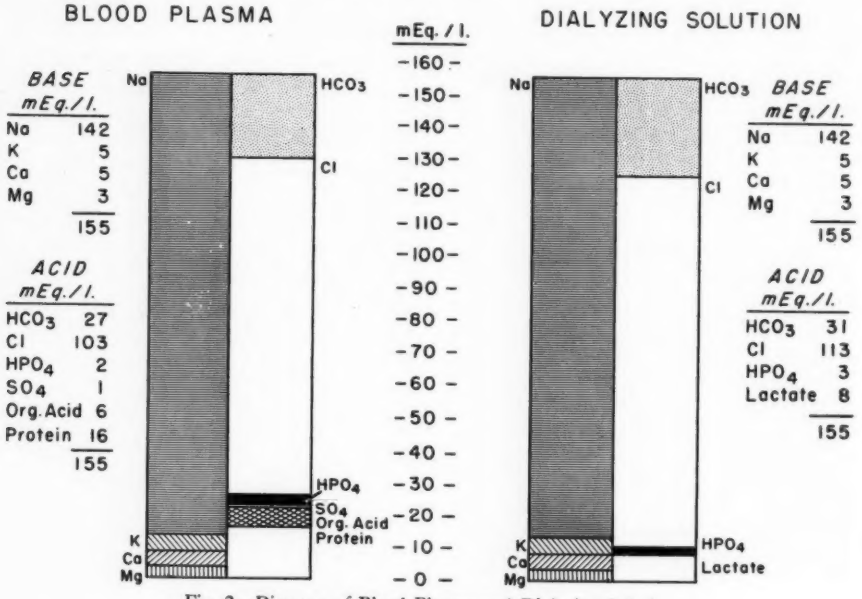

Fig. 2—Diagram of Blood Plasma and Dialyzing Solution.

B. The Dialyzing Membrane.

Ordinary, commercial cellophane is utilized as the "selective membrane."[9] When wet and swollen, cellophane will allow substances with a molecular weight of 15,000 and less to pass.[22] Urea, creatinine, uric acid, indoxyl, nonprotein nitrogen and all electrolytes, accordingly, dialyze readily.[4] The membrane is impermeable to plasma proteins, viruses and bacteria.

Reports in the literature indicate that glycerin must be washed out of the cellophane, since glycerin is hemolytic even in small quantities.[11, 23] We have studied the effect of washed and unwashed cellophane as regards hemolysis and have been unable to demonstrate any clinically significant hemolysis due to either preparation.

4. *Indications and Contraindications to Dialysis*

A. Indications.[24]

The best candidate for dialysis is that patient who, if helped over a critical period, has a reasonable hope of recovery by his own physiological mechanisms.

Acute renal insufficiency, regardless of etiology and after a trial of conservative therapy, is an excellent indication for dialysis.[25] A patient in chronic uremia may be prepared for surgery by preoperative dialysis, particularly if the surgery is directed toward correctable disease of the genito-urinary tract. The chronic uremic may be helped over an acute exacerbation of his disease and his symptoms be alleviated for months by dialyzation for a matter of hours.[2]

Very precise indications for the use of dialysis are: (1) To relieve any acute poisoning in which the substance is not completely tissue fixed (e.g., salicylates, bromides,[27] carbontetrachloride,[27] and mercurials)[4, 16], (2) to restore a specific electrolyte imbalance (e.g., hyperkalemia due to renal shutdown)[13], (3) to relieve pulmonary edema in a uremic patient, [22, 4, 28, 26] and (4) to help correct uremia and hypotension associated with hepatorenal syndrome.[26]

B. Contraindications.

Contraindications for dialysis are: (1) Active bleeding, as it is necessary to heparinize the patient during the procedure, [26, 11] (2) Severe, rapidly progressing hypertension, as the patients often show a rise in blood pressure during the first hour of the procedure[29, 26, 21, 13] (not related to the blood level of rennin),[30] and (3) chemical uremia without symptoms, as these patients can usually be maintained by conservative therapy.[29]

5. *Technique of Dialysis.*

The procedure that we now use is as follows:

The cellophane is placed in the machine in the dry, unwashed state. Boiling water is pumped simultaneously through the dialyzing and the blood side, thereby removing glycerin. Live steam is then passed through the blood side for thirty minutes, effecting sterilization. New rubber tubing is used on the blood side for each run of the machine. This eliminates possible pyrogenic reactions due to reused tubing.[21] The blood side of the machine is washed with seven to ten liters of sterile, normal saline, which hastens cooling as well as preventing hemolysis due to water remaining in the machine.

Our dialyzing solution is made up from solution "A" and solution "B," stored separately in the refrigerator. They are separate to prevent precipitation of calcium as the bicarbonate. These solutions are added to distilled water just prior to dialysis in order to give the following concentrations:

Na^+	142. mEq.	$Cl-$	113. mEq.
K^+	5. mEq.	HCO_3-	31. mEq.
Ca^+	5. mEq.	PO_4	3. mEq.
Mg^{++}	3. mEq.	lactate	8. mEq.

Glucose is added to give a level of 200 mg %. During eight hours of dialysis approximately forty gallons of solution is required. The dialyzing solution is pumped at a rate of 250–400 cc's/minute and the blood is propelled at 200–250 cc's per minute.

Large size plastic catheters are inserted into the inferior vena cava (a cut down being done on the saphenous vein and the catheter threaded up the vessel)

and into an antecubital vein. Blood is taken from the former and returned in the latter. The blood side of the dialyzer is primed with a pint of compatible bank blood that has 50 mg. of heparin added. Blood from the patient may be used if pulmonary edema is present. Dialysis is begun by joining the catheter lying in the inferior vena cava to the blood pump and then joining the antecubital catheter to the air trap.

Just preceding active dialysis, the patient's temperature, pulse, respiration, blood pressure and subjective condition are recorded. These are checked every twenty minutes. Intake and output are recorded, an indwelling Foley catheter facilitates this. The patient's weight, recorded before the procedure, is obtained every hour.[31] This is especially important if the primary purpose is removal of edema fluid.[17] An hematocrit is drawn every two hours for in this way one can follow hemolysis and exchange of fluid if they occur.[11] Ten milligrams of heparin are given to the patient every hour in order to replace that which is lost by dialysis.[32] If we are particularly interested in the removal of K^+, we make a periodic EKG to follow this ion closely.[14]

After eight hours of dialysis, the time we have empirically set for termination of the procedure, the patient is given 150 milligrams of protamine sulphate intravenously. Blood is withdrawn via the catheters for chemistries to compare with pre-run levels. As a minimum we measure Na, K, Cl, CO^2 and NPN. However, the chemistries ordered will vary in individual cases, dependent upon the indication for dialysis. The catheters are removed, pressure dressings applied, and a prophylactic antibiotic administered.

6. *Subjective, Objective and Chemical Alterations Due to Dialysis*

A. Subjective and Objective Alterations.

The comatose patient may become conscious during or shortly after the procedure. This is especially true if the removal of a substance like bromide is accomplished.[26] The withdrawal of edema fluid greatly improved vision and relieved intractable headache in one of our cases.[32] Dyspnea may be decreased if pulmonary edema is present. One worker has reported extraction of approximately twenty pounds of edema fluid during an eight hour run.[33] Twenty-four hours may pass before maximum improvement is noted, but in the chronic uremic patient forty-eight hours may elapse before clinical change is apparent.[2] Nausea and vomiting may be reduced and conservative therapy, thereby rendered more accurate and effective. Not uncommonly diuresis may follow dialysis.[34, 32]

B. Chemical Alterations.

Chemical results are often very striking. Bromides may be lowered to 80% of their initial blood level.[26] Alkalosis or acidosis may be corrected and all specific electrolytes may approach normal values. Nonprotein nitrogen may fall fifty per cent (e.g. an NPN of 200 mg. per cent was reduced to 100 mg. per cent in one of our patients during an 8 hour run). In order to evaluate the amount of urea removed, one cannot simply compare the pre-run BUN or NPN with the post-run values. It has been shown repeatedly that more urea-nitrogen can be found in the dialysate than was present by calculation in the entire body fluid of the patient. This has been found true with only a slight fall in the patient's

BUN and NPN.[7] Thus, urea contained in the patient's tissue seems to replace that which is lost by dialysis.[21] As a consequence, we now measure the urea contained in a representative sample of the used dialysate[7] and as much as 200 grams of urea has been removed by our procedure in an 8-hour period.

An unexplained finding following dialysis is a reduction in serum protein concentration.[25, 31] As the patient's weight is often unchanged, the explanation cannot be simple dilution. Whether this change in protein concentration is clinically significant is not known at this time.

7. *Generalizations about Dialysis*

At this time our experience is too meager to support generalizations. To date Merrill et al have had the most extensive experience with extra-corporeal dialysis in this country. From about 250 clinical trials they have arrived at the following conclusions:

(1) There is good correlation between clinical improvement and chemical changes.[2]

(2) The polyuric, normotensive patient responds better and for a longer time than the relatively oliguric, hypertensive and uremic patient.[29]

(3) The chronic uremic patient with a urine volume greater than 1500 cc's per day, who has no hypertension, and who fails to respond to conservative therapy may expect a good response to dialysis.[29]

(4) Successive dialysis tends to be less successful.[29]

(5) Patients with acute glomerulonephritis and especially with severe hypertension, respond poorly to dialysis.[29]

8. *CONCLUSION*:

From reviewing the enlarging literature on dialysis and from our experience, we believe that this procedure is a useful adjunct in the treatment of selected types of uremia, as well as specifically indicated in other conditions previously cited. We feel that the results obtained will vary directly with clinical experience and, therefore, will improve with further application. In the future we will undoubtedly see many more and varied disease states in which dialysis may be an accepted part of therapy.

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BILATERAL FRONTAL LOBE LEUCOTOMY

Its Place as a Therapeutic Agent

LORNE D. PROCTOR, M.D.*

As the title of this presentation implies, we are dealing with a surgical procedure and if nothing else has been accomplished, this procedure has brought together the psychiatrist and the neuro-surgeon in a common field that most certainly has made for better understanding between these two branches of medicine. Throughout the discussion of this subject, we are dealing primarily with the therapeutic value of one of the many types of leucotomy so-called, namely the section of the frontal thalamic and hypothalamic association fibres which are severed to the extent of approximately 3/5 of their number, in the posterior 1/3 of each frontal lobe.

In the human there is no obvious intellectual defect following the removal of either frontal lobe. When both lobes are removed, the individual shows a marked change. This change can be compared to the inebriate state without ataxia. The individual becomes boastful, careless and lacks judgment. He lacks initiative and is incapable of planning and cannot grasp complicated problems. Such an individual could operate a simple boat. He would require his frontal lobes, however, to be taught anything more than the rudiments of sailing. He would require his frontal lobes to appreciate the danger of a storm and plan appropriate action. Such complicated thinking, where one idea follows another logically, has been termed by the psychiatrist, synthesis. The reaction following such thinking is governed by judgment. Synthesis and judgment are both conditioned by knowledge gained in the past (experience), and further conditioned by emotional tone (mood). We are aware that all behaviour is conditioned by emotional tone. It has been shown that there are basal centres (hypothalamus) which, in the animal deprived of his frontal lobes, can produce on stimulation a state of fear to the point of protective combat. However, such emotional tone is a primitive survival mechanism and does not allow the fine judgment that is required in our complex social life. This primitive reaction is conditioned by centres in the frontal lobes, and if we consider the reflex-like arcs involving association tracts from the sensory cortical areas to the thalamus and hypothalamus, and from the frontal cortex to the thalamus and hypothalamus we are able to postulate the dynamics of the production of emotional tone. If the hypothalamus is overactive to impulses received from the frontal cortex and thalamus, so as to be stimulated and produce a state of fear, we would expect to find an emotionally unstable, fearful individual whose complex delicate mental processes are distorted by this abnormal emotional tone. On this basis, the breaking of these so-called reflex arcs should bring about at least a partial reduction of the stimulation that was affecting the hypothalamic centres and the patient's fear should be reduced.

*Chief of Division of Neurology and Psychiatry.

Given before The Detroit Academy of Medicine, January 13, 1953.

If a complete break occurs, euphoria may result. We know that removal of both frontal lobes abolishes fear. Inasmuch as the neuro-surgical procedure involves a very small incision in the cortex, little impairment would be expected in the other complex functions in this part of the brain (intellect, judgment, synthesis, etc.) and as the incision involves approximately 3/5 of the association tracts between the frontal cortex, thalamus and hypothalamus, there still remains a limited connection to permit the conditioning of our emotional tone and thus our behaviour, by the frontal cortical areas and thalamus.

Dr. C. B. Farrar, Dr. K. G. McKenzie (1) and my interest in bilateral frontal lobe leucotomy was stimulated by Freeman and Watts, and in 1939 we visited Washington and were shown a number of their cases. In 1941 the Rockefeller Research Unit of the Toronto Psychiatric Hospital embarked upon the psychosurgical treatment of hopelessly mentally ill patients. The first patient chosen was a mentally defective female, aged 58, suffering from an involutional agitated depressive state with paranoid features. She had been ill for 2 years previous to the operation, having had a remission of five years duration from a prior mental illness. At the time of operation, she continually described "little men" who were hammering at her brain and slowly killing her and because of this she felt she would be better dead. There were bouts of weeping and an undercurrent of anxiety which resulted in her pacing about the ward constantly, obviously fearful of what was going to happen. She found it progressively difficult to attend to her toilet habits and she was agitated to the point where she had no appetite. She had lost weight over the period of her illness and at the time of operation her weight was 92 lbs. Following the bilateral frontal lobe leucotomy there was an immediate disappearance of anxiety. At the end of two months she had gained approximately 15 lbs. in weight. She now was able to help in the care of other convalescent patients in a boarding-out home, being limited only by her mental deficiency. In view of this remarkable improvement, 47 patients were subjected to this treatment during the next 11 years.

Since 1939, as a conservative estimate 15,000 or more cases have been subjected to a bilateral frontal leucotomy of one kind or another and although there still is a difference of opinion as to its value in the schizophrenic group, most investigators agree that it is useful in reducing the acute nursing problem in the very agitated schizophrenic. In the affective disorders, particularly the involutional melancholias, better than 50% of cases in most series reported have shown a marked improvement, in most cases allowing the patient to return home and often return to remunerative employment. In the selection of cases from a psychiatric standpoint, the criterion employed required at least pathological fear in the clinical picture. This fear was manifested by anxiety, agitation or impulsive behaviour and it is my feeling that in spite of the many and varied suggestions that have been made as to the criterion for the selection of patients, this one at least is the most reliable. Since 1948 this operation has been used in the treatment of intractable pain, Walter Freeman again pioneering this therapy in America. He

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concludes that it is a valuable adjunct in the treatment of unbearable pain, affecting not the sensation but the psychic component, namely emotional reaction to this phenomena. The patient feels the pain but does not suffer in the same degree because of this sensation. In 1951 Felix Mandl instituted the technique in which a temporary so-called leucotomy or lobotomy was performed by injection of 1% procaine into each frontal lobe and if this procedure brought about a marked diminution in the patient's discomfort and was not permanent, then the leucotomy procedure could be performed. Dr. K. G. McKenzie and Dr. W. S. Keith and I have had a small series of cases of intractable pain and have had an opportunity of trying unilateral as against bilateral frontal leucotomy. In approximately 6 cases treated, unilateral leucotomy was of no significant benefit but a bilateral procedure brought about an improvement in 5 of these 6 patients. This group has been followed for approximately 5 years without relapse.

In a number of the patients, insulin shock therapy, as the treatment for schizophrenia, with electroshock as the treatment in depressed mental states, had failed to bring about a maintained improvement. All patients had been ill for more than 2 years with little hope for any significant improvement at any time in the future.

Results—Between 1941 and 1952, 47 patients were subjected to the surgical procedure described, of which

20 were affective disorders, 15 recovered, 3 improved, 2 unchanged
23 were schizophrenics, 4 recovered, 11 improved, 8 unchanged
4 were anxiety states, 4 recovered.

These patients have been followed not less than 8 months and most of them from 2 to 11 years. These results show a recovery or improved mental state of 90% in the affective disorders and 64% in the schizophrenic and schizo-affective states. The anxiety states show a 100% recovery rate.

Complications—The most serious complication following bilateral frontal lobe leucotomy is cerebral hemorrhage, but fortunately this complication has not occurred in this group. There have been no obvious neurological abnormalities as a result of the procedure, and the only complication has been hypersexuality noticed in 25% of our cases. This difficulty is often seen in neoplasms or other lesions involving the frontal lobes. The complication has not presented a serious feature as it has been manifested by either unusual demands upon the marital partner, or increased masturbation. No anti-social sexual behaviour has been reported, referable to the complication, in our series of patients. Usually the increased libido persists for 9 to 18 months, gradually returning to normal. Patients gain from 15 to 50 pounds during the six months following the operation. In our group, about 1/3 of the patients had transitory urinary incontinence, but this never lasted beyond three to four weeks post-operatively. There were no cases of convulsions in our series and we suggest this excellent result is probably because of the slight cortical damage done by the instrument used. Most series show 3–5% or greater incidence of this complication.

Summary and Conclusions—We have now available a neuro-surgical procedure which provides a means of improving suitably selected cases previously categorized

as hopelessly mentally ill. At least they are much less uncomfortable and, in better than 50% of cases, are able to be rehabilitated socially and vocationally, rather than requiring extensive institutional care. In cases of continuous acute pain, the affective component of this pain can be reduced and thus a reduction made in the suffering of the patient. We appreciate that it is a mutilating operation but it is not an empirical therapy, there being adequate basis for this procedure in our understanding of the neuro-anatomy and neurophysiology of the brain. Bilateral frontal leucotomy has opened a new field in our psychiatric concepts, inasmuch as we bring about at least a reduction in the degree of mental illness by reducing the function of a part of the complex cerebral mechanism.

Nissl remarked to one of his students while they were observing Paris from the Eiffel Tower one evening, that the spectacle brought to mind the multitude of cortical cells flashing on and off in our complex brains. After some thought he added that Paris probably could get along very well with a good number of these lights not functioning, and no doubt he felt this applied to the human brain as well.

The leucotomy has definitely established that we do fairly well in spite of more than half of the connections being severed between the frontal lobes and the lower centres and this would add credence to Nissl's philosophical comment. There is something to be said for moderation, even in cortical activity.

POST-IRRADIATION FIBROSIS OF THE LUNG AND ITS SURGICAL TREATMENT

CONRAD R. LAM, M.D.*

The effect on the lungs of large doses of roentgen rays has been recognized for many years. In 1921, Groover, Christie and Merritt[1] reported in the congress of the Southern Medical Association that in a considerable number of cases of mammary cancer treated by irradiation, a non-productive, irritating cough appeared coincidentally with the cutaneous reaction. Shortly thereafter, changes appeared in the roentgenograms of the lungs. Infiltration was visible in the hilar region which spread to most of the involved lung in a period of three or four weeks. Dyspnea and cough became severe. In some instances, the lesion regressed considerably after reaching its maximum but in others, there was residual difficulty.

Since the original report, other authors[2-4] have presented series of cases of post-irradiation damage to the lung. The extensive review of Desjardins[5] has references to 298 articles.

The nature of the lesion and the possibilities of surgical treatment are evident from the following two case reports.

Case 1—E.M., a 54-year-old white woman, was first seen in the Henry Ford Hospital in September, 1945. Six years before, a radical mastectomy had been performed for cancer of the left breast and this had been followed by radiation therapy. Details of dosage and method of treatment are not available. Pain in the chest and cough which was productive of small amounts of sputum appeared promptly. During the six years, these symptoms gradually became worse. Roentgenogram of the chest showed that extensive damage had been done to the left

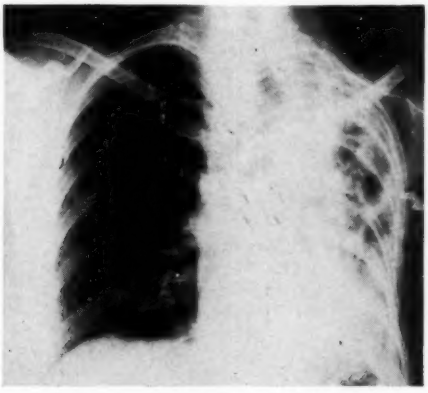

Fig. 1—Roentgenogram of chest, Case 1, showing extensive destruction of left lung by irradiation.

*Surgeon in charge of Thoracic Surgery.

lung (Fig. 1). It appeared to be extensively involved with fibrous tissue, cystic spaces and atelectasis. There was marked deviation of the trachea. Symptomatic treatment for the cough was prescribed and the patient was discharged from the hospital.

Three months later, she was readmitted because of the increasing severity of symptoms. Coughing occurred more frequently and in paroxysms which terminated in nausea. At this time it was noted that the vital capacity was 1135 cubic centimeters. The patient left the hospital unimproved and was admitted again two months later. She was very short of breath and cyanotic, even in oxygen. After two days, there was a precipitous fall in blood pressure; this appeared to be due to gastrointestinal bleeding because she vomited material resembling coffee grounds. Death followed in a few hours. At autopsy, it was found that the left lung consisted almost entirely of dense fibrous tissue separated by cystic spaces. The pericardial space was obliterated. There were several acute ulcers in the stomach and duodenum. One could theorize that these were due to "stress." Residual carcinoma could not be demonstrated.

Case 2—W.W. was a 57-year-old white woman, on whom a radical mastectomy was performed elsewhere in June 1951 for carcinoma of the right breast. Two weeks after the operation, radiation treatment of the operative area was begun. Treatments were given six times weekly for 6 weeks. The roentgen doses were summarized as follows:

690 R to the neck through a 15 x 15 cm. port.
2390 R to the right chest and supraclavicular area through 15 x 15 cm. port.
1890 R to the anterior right axillary region through 10 x 15 cm. port.
1560 R to the right posterior axillary region through a 15 x 15 cm. port.

Ten days after the last deep therapy treatment, the patient was admitted to another hospital because of fever and cough. The roentgenogram of the chest showed infiltration of the upper part of the right lung (Fig. 2a). The presumptive

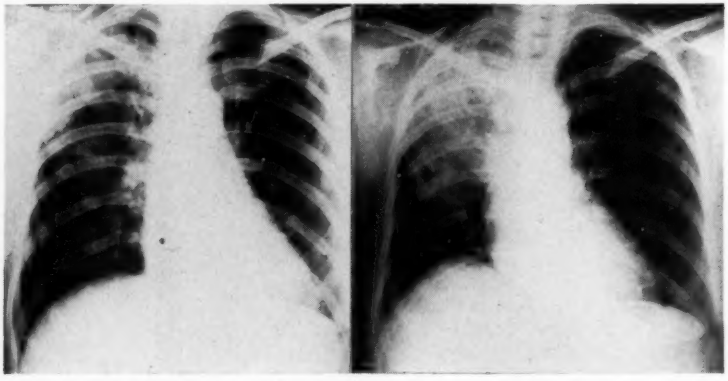

Fig. 2a Fig. 2b

Fig. 2—Roentgenograms of chest, Case 2. A, Aug. 5, 1951. B, two weeks later, with marked increase in lung involvement.

diagnosis was a typical primary pneumonia with incomplete resolution and atelectasis. In spite of intensive treatment with antibiotics, there was extension of the process in the right lung during the next two weeks (Fig. 2b). The sputum was negative for tubercle bacilli and neoplastic cells. Bronchoscopy showed nothing except deviation of the trachea to the right. Roentgenogram of the chest early in September revealed more involvement of the right lung and more shift of the mediastinum. The diagnosis of post-irradiation fibrosis of the lung was made at this time (Fig. 3a).

During the next eight months, the patient became increasingly short of breath. Sleep was difficult because of an irritating, almost non-productive cough. It was necessary to administer antibiotics continually to avoid secondary infection in the lung. In May, 1952, the x-ray picture of the lung was similar to that of the previous September (Fig. 3b).

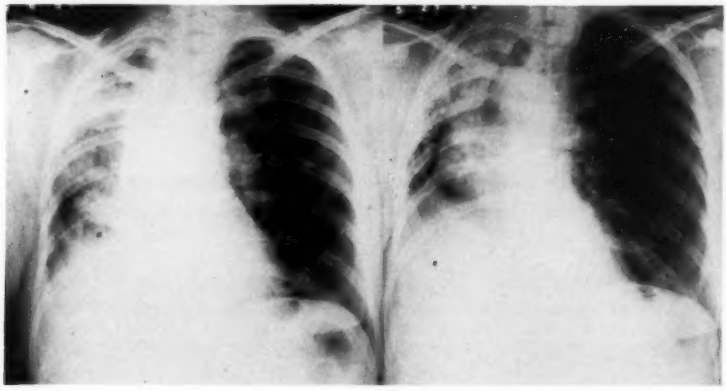

Fig. 3a Fig. 3b

Fig. 3—Further roentgenograms, Case 2. A, Sept. 6, 1951. B, May 21, 1952.

The patient was admitted to the Henry Ford Hospital in June, 1952. Because of the favorable results obtained in two cases treated by pneumonectomy, reported by Bergman and Graham,[6] this operation was recommended as the only solution for her problem.

The operation was carried out on July 2, 1952. The lung was exposed through a right postero-lateral incision through the fifth interspace. Extensive pleural adhesions had been expected, but they were not present. There was a small amount of fluid in the pleural cavity. The lung was small and fibrotic; it was air-containing only in a portion of the lower lobe. The pulmonary vessels were small and the pneumonectomy was technically easy to perform.

The patholgists' description of the excised lung (Fig. 4) was as follows: "The specimen consists of a lung which weighs 167 grams and which measures 16 by 8 by 3.5 centimeters. The lung barely floats in water. The external surface is light gray, mottled with a moderate amount of black pigment. There is a plaque of light gray fibrosis over the medial portion of the lower lobe. The mucosa of

Fig. 4—Photograph of right lung (Case 2). The smooth pleural surface is striking.

the bronchus is smooth. Upon cut section, the parenchyma of the upper lobe is deep gray and very solid in consistency. That of the lower lobe is only slightly less dense.

"Microscopic examination (Fig. 5): Sections through the pulmonary tissue show extensive changes characterized by the following features. There is an ex-

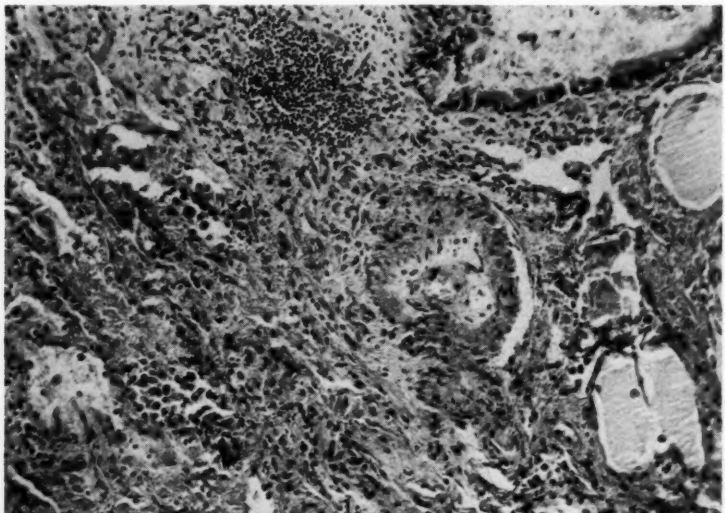

Fig. 5—Photomicrograph of lung tissue (Case 2). There is almost no alveolar structure. Near the center of the section in an arteriole with its lumen almost obliterated.

tensive, difuse fibrosis with thickening of alveolar septa. Most of the alveolar spaces are relatively airless and are filled with moderately large numbers of macrophages. These frequently show a brownish discoloration of their cytoplasm. In some places, the macrophages have fused to form multinucleated giant cells. The second prominent change consists of intimal thickening and fibrosis of most of the smaller and medium sized arterial channels. Several of the smaller respiratory bronchioles show squamous metaplasia of their lining epithelium, and many of these are filled with mucinous material. Some of this material is also found in dilated alveolar spaces adjacent to these structures. There are moderatd numbers of chronic inflammatory cells scattered about diffusely throughout the tissues. Pathologic diagnosis: Post-irradiation fibrosis of the lung (Dr. Henry Tesluk)".

The patient's postoperative course was satisfactory. The cough which had been so distressing before operation was not present afterward. Postoperative roentgenogram of the chest showed that the trachea was in the midline. She was discharged from the hospital four weeks after the operation. A report from the patient's physician nine months later indicates that she continues to be greatly improved. Her only complaint is of mild dyspnea with exertion.

SUMMARY

Two cases of extensive fibrosis of the lung following radiation treatment for carcinoma of the breast have been presented. One of the patients died of this complication, while the other is in relatively good health following pneumonectomy.

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RECURRENT MONARTICULAR ARTHRITIS CAUSED BY RETAINED "VEGETABLE" FOREIGN BODY

JOHN LYFORD, III, M.D.*

Recurrent monarticular arthritis, especially when it involves the knee, constitutes a difficult problem in differential diagnosis including the gamut of trauma, tuberculosis, infections by fungi or organisms of the pyogenic or pleuropneumonia groups, osteochondritis dessicans, pigmented villonodular synovitis, and intermittent hydrarthrosis.

A review of the literature at the time the present case was encountered revealed only one report[1] concerning arthritis due to retained foreign bodies of "vegetable" origin. Subsequently another report has appeared.[2] In 1940 Key[1] discussed the occurrence of foreign body arthritis, and among his cases described one in which a thorn entered the knee causing swelling lasting seven weeks; and at operation a small tip of the thorn was embedded in the synovia. Microscopic examination of synovia removed at operation revealed foreign body giant cells, leococytic infiltration, and villus formation. Karshner and Hanafee[2] in April, 1953 reported seven cases of monarticular effusion in children caused by retained palm thorns. They described in detail the clinical picture of original trauma, often obscure, initial swelling and fever subsiding on conservative measures, only to intermittently recur over a period of from seven days to 2½ years. Of the seven cases reported, retained thorn was found at operation in six instances. Microscopic examination of tissue removed at operation from the involved joints revealed hypertrophic synovitis with granulation tissue and foreign body giant cell reaction.

Thus, at present there have been reported only eight cases of monarticular arthritis resulting from a retained "vegetable" foreign body (thorn). The present case is presented as an additional example of this relatively rare situation; and illustrates again the difficulty in diagnosis of recurrent monarticular effusion, indicating the importance of obtaining a detailed history, adequate laboratory studies, and the value of "exploratory" arthrotomy in obscure joint involvement.

CASE REPORT

M.M.B., a white female child, age 5 years, was seen in the Henry Ford Hospital Orthopedic Clinic December 10, 1952. Her mother gave the history that ten weeks previously the child had sustained a penetrating wound of the left knee from a sliver of palm wood, while visiting in California. An attempt to probe the wound of entrance immediately after the injury did not reveal any foreign body. The child experienced pain but little swelling of the knee for about one week; and then seemed to have no symptoms. Four weeks later the knee became swollen, and an aspiration was performed, after which the knee remained swollen, but there was no pain.

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Physical examination revealed the left knee to be moderately swollen with evidence of fluid within the joint cavity; and motion of the joint was essentially free and painless. There was a small (1 mm.) scar on the medial aspect of the left knee just medial to the tibial tubercle.

Radiograms of the left knee revealed no abnormalities except slight soft tissue swelling in the suprapatellar area. Radiogram of the chest was normal.

Laboratory studies revealed both the coccidiodin (1:1000) and tuberculin (PPD No. 1) skin tests to be negative; fluid aspirated from the left knee joint revealed no growth in cultures for pyogenic organisms, acid fast bacilli, and fungi; hemoglobin 13.1 grams, RBC 5.17 million, WBC 7,550 with PMN 73%, lymphocytes 26%, and monocytes 1%; sedimentation rate 19.

Because the effusion of the left knee recurred after aspiration, the patient was admitted to the hospital; and January 10, 1953 an arthrotomy of the left knee was performed. When the joint capsule was opened cloudy fluid escaped under pressure as did a mass of organized mucoid material about 1 x ½ inches in size. Overlying the attachment of the medial cartilage was an area of thickened synovia, and embedded in this were two free fragments of wood, measuring 3/16 inch in length and about 0.001 inch in diameter.

Microscopic study of the material removed from the knee at operation revealed synovial tissue which was fibrotic and infiltrated with chronic inflammatory cells; and a foreign body of refractile greenish material in which large cellular-like structures were present.

The post-operative course of this patient was uneventful, and when last seen three months after operation was entirely symptom free, and the left knee showed no evidence of swelling or effusion and there was a full, free, painless range of active and passive motion of the knee.

COMMENT

The condition of recurrent monarticular arthritis resulting from retained "vegetable" foreign bodies (thorn) is discussed. Reports of only eight such cases were located in the literature. An additional case of this condition is presented, including the details of the findings at operation and a microscopic study of material removed from the involved joint, to re-emphasize the value of adequate laboratory studies and "exploratory" arthrotomy in instances of obscure joint involvement.

ACKNOWLEDGMENT

Grateful acknowledgment is expressed to Dr. Edward L. Quinn, Physician-in-Charge, Division of Infectious Diseases, Department of Medicine, for his inestimable assistance in the diagnosis in this case.

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ABSTRACTS FROM RECENT ARTICLES BY THE PROFESSIONAL STAFF

CAT-SCRATCH DISEASE. EDWARD L. QUINN, J. Michigan M. Soc. 52:71, 1953.

The newly described clinical entity, Cat-Scratch Disease, is characterized by a localized glandular involvement, frequently related to a cutaneous lesion at the site of a scratch inflicted by a cat. The regional adenitis may proceed to suppuration, with formation of bacteriologically sterile pus, or it may resolve spontaneously without suppuration. Fever and malaise are moderate to absent. Diagnosis is established by a specific skin test with an antigen prepared from the pus from the lymph node of a typical case. The first such case to my knowledge in this area is reported and four additional cases have been seen at the Henry Ford Hospital in 1952.

The skin test utilizes the principle of the original Frei test. Pus from a typical case, diluted one part with five parts isotonic sodium chloride, is heated at 56°C. for one hour on two successive days. The test is performed by injection intradermally of 0.1 cc. of this material and read in forty-eight hours, a positive reaction being comparable to the tuberculin test.

Search for an etiologic agent has apparently excluded the known bacteria, fungi, virus and animal parasites and led to the belief that the condition is probably due to an unknown virus. The cat probably transfers the etiological agent only passively. Inoculation by inanimate objects contacted by cats, in the absence of cat scratch, has been recorded, i.e., thorns and wood splinters. Other assumed means of transmission are injury to the skin by a beef bone, mosquito bite, and laceration while butchering pork. Some serologic relationship to the lymphogranuloma-psittacosis group of viruses is suggested by the complement fixation test.

Cat-scratch disease should be suspected in any case of unexplained regional lymphadenitis.

THE SURGICAL TREATMENT OF MITRAL STENOSIS. CONRAD R. LAM, J. Michigan M. Soc. 52:48, 1953.

Since March 31, 1950, 82 patients have been accepted for surgical correction of mitral stenosis. The method of Bailey and his associates, commonly called "commissurotomy" was used extensively, although it has been found that an increasing number of valves can be opened by the finger alone. There were five hospital deaths in the first 19 patients and only four in the last 63 patients. Another three patients died several months after discharge from the hospital. The causes of death in these were residuals of cerebral embolism, persistence of regurgitation, and recurrence of stenosis after a partially successful finger fracture. Of the seventy living patients, two are unimproved and the others are considered to have good or excellent results.

The operative technic has been essentially that described by Bailey and his associates. The approach has been through the bed of the resected third rib, with transaction of the second and fourth costal cartilages. A modified rubber glove, with a "sixth finger" added to the region of the thenar eminence has been used to prevent hemorrhage while the guillotine is in the auricle. The knife passes through this finger and a tight ligature can be applied. This glove was designed by Dr. Edward Munnell, Fellow of the Michigan Heart Association.

The presence of mitral regurgitation has been the commonest contra-indication to operation. This has been recognized by the finding of an apical systolic murmur transmitted well into the axilla, marked enlargement of the left auricle and left ventricular hypertrophy. No patient who exhibited marked heaving of the chest from cardiac activity has survived the operation. Apparently, this sign is indicative of left ventricular hypertrophy and valvular pathology other than mitral stenosis.

FEMORAL ARTERIOVENOUS FISTULA WITH FALSE ANEURYSM: Report of A Case with Early Restorative Operation. CONRAD R. LAM, Am. Surg. 18:78, 1953.

Formerly, arteriovenous fistulas were treated surgically by allowing a period of time to elapse for the formation of collateral vessels, after which the fistula was excised with quadruple ligation of the involved vessels. While not resulting in gangrene as a rule, such treatment left poor functional results.

A patient was admitted five weeks after a stab wound of the middle of the thigh, with a large pulsating mass under the fascia and a continuous bruit. The diagnosis of femoral arteriovenous fistula with a large false aneurysm was made. Operation was carried out immediately. The femoral artery was exposed through normal tissue at the groin, after which the hematoma was exposed, and a restorative procedure was carried out. Two holes were present in the femoral artery, one of which communicated with an opening in the vein. The two vessels were separated, the opening in the vein was closed with a longitudinal suture, the segment of artery containing the two holes was excised and the continuity of the artery was restored by end-to-end suture, utilizing Potts' serrated ductus clamps for hemostasis and traction. An excellent functional result was obtained.

THE DIAGNOSIS AND TREATMENT OF CONGENITAL CARDIOVASCULAR DEFECTS IN INFANTS. ROBERT F. ZIEGLER, CONRAD R. LAM and RICHARD E. SHIPLEY, Postgrad. Med. 13:141, 1953 (a Scientific Exhibit).

"An attempt has been made in this exhibit to show pictorially the most important anatomic, clinical, roentgenographic, electrocardiographic, physiologic and surgical data in the more common operable congenital cardiovascular defects in infants. Particular attention should be directed in each defect to the most important diagnostic procedures listed with the clinical features and physiologic data. It should also be noted that while the diagnostic criteria and operative procedures are given particularly for infants, they are also generally applicable to all ages. The main thesis of this exhibit, however, is that an accurate diag-

nosis *can* be made even in early infancy and that surgical correction *is* frequently necessary and *may* be accomplished safely and successfully in this age group."

A diagram, a typical x-ray, and a sample electrocardiogram are shown: of the normal; the aortic ring; the patent ductus arteriosus; coartation of the aorta; pulmonary stenosis with closed septum; pulmonary stenosis with auricular septical defect or patent foramen ovale; tetralogy of Fallot; and tricuspid atresia.

PHYSIOLOGY OF THE OVARIAN VEINS DURING PREGNANCY. C. PAUL HODGKINSON, Obst. & Gynec. 1:26, 1953.

In this study, four phases of ovarian vein physiology were evaluated. These include observations of the microscopic anatomy of the vein wall, measurement of the diameter of the ovarian vascular pedicle, estimation of the blood pressure of the ovarian vein at the time of cesarean section, and comparative oxygen-saturation analysis of samples of blood from the veins of the arms, legs, and ovarian vascular pedicle. The pelvic veins were not considered to be a blood depot in pregnancy. These studies presented evidence that the placenta did not function as an arteriovenous fistula as suggested by Burwell.

METASTATIC SARCOMA OF THE HEART DIAGNOSED ANTEMORTEM. THOMAS N. JAMES, J. Michigan M. Soc. 52:57, 1953.

Cardiac metastases are present in approximately four per cent of all patients with disseminated malignant disease. Over 500 cases of secondary malignancy of the heart have been reported in the literature. Primary malignancy of the heart occurs about one-fifth as often, and a large number of these have been small fibromata or myxoma, both of which are cytologically benign. Twenty secondary and five primary malignancies of the heart have been diagnosed during life. Possibility of such a diagnosis should be entertained in any patient who develops a murmur, pericardial effusion, bizarre recurring arrhythmias, intractable congestive failure, or an unusual cardiac silhouette which cannot otherwise be explained. Postural alteration in murmurs is suggestive.

The case reported is one of a 58 year old woman who had a hysterectomy for sarcoma of the uterus. Seven months later she was re-hospitalized because of an abdominal wall mass, later proved to be metastatic sarcoma. During the latter hospitalization she developed progressively increasing congestive failure and cyanosis, a pulmonic murmur of increasing intensity, an enlarging cardiac silhouette on x-ray (especially the right upper border) and an electrocardiogram of progressively increasing delay in conduction in the right ventricle. She expired suddenly on the 28th hospital day.

Autopsy revealed a very large polypoid mass attached to the right septal myocardium and filling most of the right ventricular cavity; it extruded up through the main pulmonary artery, acting much like a plunger in a syringe. Histologically the cardiac tumor was identical to that in the uterus. Pulmonary metastases were minute.

This is the first reported case of sarcoma of the uterus metastasizing to the heart.

EVALUATION OF THE SAFETY OF CORTICOTROPIN (ACTH) AND CORTISONE IN PREGNANCY. R. R. Margulis and C. P. Hodgkinson, Obst. & Gynec. 1:276, 1953.

Twenty-eight pregnant patients were studied to determine how these drugs affect the four important physiologic phases of pregnancy. The questions which faced the investigators were: can ovulation and pregnancy occur during or shortly after, ACTH and cortisone therapy? Does ACTH or cortisone therapy adversely influence the hormonal and electrolyte balance of pregnancy? What effect do these hormones have on labor? And finally, what is the effect upon the somatic and mental development of infants of mothers who received ACTH or cortisone during pregnancy?

The amount of ACTH that was administered varied from 40 to 120 mg. daily. Cortisone was given intramuscularly or orally in amounts varying from 12.5 to 300 mg. daily. The largest amount given to an individual patient was 8350 mg. of ACTH and 8010 mg. of cortisone. The duration of administration of these hormones ranged from 2 days to 14 months.

In the dosage used in this study, ACTH and cortisone administered during pregnancy did not: prevent ovulation or future conception; increase the incidence of abortions, miscarriages, or premature labor; alter labor or increase postpartum complications; significantly alter serum potassium or sodium, and plasma chlorides; produce hyperglycemia; significantly elevate blood pressure; cause edema and excessive weight gain; produce or aggravate toxemia of pregnancy; retard somatic or mental development of the infant. However, infants delivered of mothers receiving cortisone may immediately after delivery demonstrate withdrawal symptoms suggestive of hypo-adrenal cortical activity.

AUTOMATIC CASSETTE CHANGER FOR ANGIOGRAPHY. Richard F. McClure, Howard P. Doub, and Richard E. Shipley, Radiology 60:85, 1953.

In this paper we describe the construction and operational details of an automatic cassette changer which has proved useful in various angiographic examinations. The device is easily constructed from materials which are available to any carpenter and requires no complicated machinery. It uses the standard 10 x 12 inch cassette, does not easily get out of adjustment, and can be built at a fairly low cost. In the development of angiography, many types of apparatus have been designed to accomplish rapid serialization of the examinations. Some of these require special films and darkroom procedures which are not routine in the standard radiographic department.

HEREDITARY CAPILLARY FRAGILITY. Raymond W. Monto, Donald W. Bales and Michael J. Brennan, J. Michigan M. Soc. 52:62, 1953.

Twenty-four cases of hereditary capillary fragility are added to the reported cases for a total of ninety-nine patients. Capillary microscopy in five patients failed to demonstrate abnormalities in the morphology of the capillaries. In five patients protamine titrations for the detection of circulating heparinoid substance

gave normal values. Rutin in divided doses of 200-400 mg. every day favorably influenced the bleeding tendency in some cases. Examples of thrombocytopathic purpura (Glanzmann's disease) were not encountered.

FURTHER OBSERVATIONS ON MEDULLARY SPINOTHALAMIC TRACTOTOMY. Albert S. Crawford and Robert S. Knighton, J. Neurosurg. 10:113, 1953.

We have reported 8 additional cases of intractable pain in upper levels treated by medullary spinothalamic tractotomy. We feel that this is the preferable surgical procedure for treating intractable shoulder-arm pain. We believe that the experiences of other neurological surgeons will corroborate our results and that this operation should become the generally accepted procedure for this condition.

The associated trigeminal sensory changes were pointed out to help settle the exact anatomical relationships in this area.

It would be even more desirable if a subtotal differential section of the spinothalamic or of the trigeminal tracts could be made in the medulla which would give long-lasting results.

DYSPHAGIA. Donald S. Bolstad and Jack S. Campbell, J. Michigan M. Soc. 52:187, 1953.

An attempt has been made to assemble all the data necessary for the physician to make a differential diagnosis on dysphagia. Prevailing surgical procedures and medical management are outlined.

ACUTE PANCREATITIS. Laurence S. Fallis, Proc. Royal Soc. Med. 46:113, 1953.

In summary, it may be said that (1) acute pancreatitis is a commoner disease than is usually supposed; (2) there are many phases of the disease other than the classical acute pancreatic necrosis; (3) diagnosis is frequently overlooked because acute pancreatitis is not considered in the differential diagnosis of obscure abdominal conditions; (4) the outstanding diagnostic features of the disease are the severity of the pain and the elevated serum amylase; (5) conservative or nonoperative treatment gives the best results; (6) when the attack has subsided investigation of the biliary tract should be done and definite surgery carried out when indicated.

CRYSTALLINE B_{12} INHALATION THERAPY IN PERNICIOUS ANEMIA. Raymond W. Monto, John W. Rebuck and Michael J. Brennan, Am. J. M. Sc. 225:113, 1953.

Inhalation therapy with crystalline B_{12} in physiological saline and lactose dust has resulted in adequate clinical and hematologic responses in 3 patients, 2 presenting severe and one mild grades of pernicious anemia. Detectable amounts of B_{12} activity in the urine were found after pulmonary administration of this substance.

RECOGNITION AND MANAGEMENT OF BLEEDING DISORDERS IN ORAL SURGERY. James T. Howell and Raymond W. Monto, J. Oral Surg. 11:129, 1953.

A comprehensive medical history must be taken and a searching physical examination made in order to reach an accurate diagnosis of the hemorrhagic disease. Proper treatment requires a precise diagnosis. The basic principles of rest, application of cold and pressure are useful in the primary management of a bleeding problem. Systemic therapy depends on an intimate knowledge of the disease pattern.

It is recognized that hemorrhagic diseases frequently manifest themselves in the oral cavity. Many of them can be managed by the oral surgeon but others will require the cooperative assistance of an internist or hematologist.

THE TRIDIMENSIONAL NATURE OF THE SICKLING PROCESS. John W. Rebuck and Ruth M. Sturrock, Anat. Rec. 115:362, 1953.

Dual studies of anemia sickle cells, demonstrating the gamut of structural changes from promeniscocyte to completely sickled forms, were made with the electron microscope. Direct micrographs of individual sickle cells were first obtained. The erythrocytes were then removed from the microscope, shadow-cast with chromium and tridimensional micrographs of the same cells were again obtained in the electron microscope for comparison. Eccentric massing of corpuscular aggregates became manifest at promeniscocytic stages previously dismissed as being merely macrocytic. The next stage of bar-like massing of the hemoglobin and possibly other erythrocytic constituents was confirmed tridimensionally. The later stages of so-called "tactoid" formation in which fusiform cells were observed by direct microscopy did not always prove to be spindle-shaped when studied in the manner herein described. Finally, the bizarre outcroppings of completely sickled cells were studie from the standpoint of constituent, aggregational elevations.

A COMMENT ON NATURALLY RADIOACTIVE COMMERCIAL GLAZES. L. E. Preuss, Nucleonics 11:53, 1953.

W. H. Hoather has recently reported that radioactive building tiles were found at the Derbyshire Royal Infirmary in amounts sufficient to produce serious elevations of the background count. The purpose of this note is to point out that this hazard is not limited to tile produced in England, but is present in tile produced in large quantities in the United States.

ADENOMATOUS POLYP OF THE JEJUNUM COMPOSED OF GASTRIC MUCOSA. Ira Gore and William J. Williams, Cancer 6:164, 1953.

A second instance is reported of an adenomatous jejunal polyp composed of gastric mucosa. Clinically, the lesion had caused intussusception leading to its removal. Historically episodic abdominal complaints, weight loss, anemia, and

melena had occurred during the previous year. While a congenital origin for the lesion cannot be refuted, some of its histological features seem better explained as a consequence of metaplasia.

QUANTITATION AND CLASSIFICATION OF LYMPH NODE CELLS TRANSFERRED FROM RABBITS INJECTED WITH ANTIGENS TO RECIPIENT RABBITS. J. W. Rebuck, T. N. Harris and Susanna Harris, Fed. Proc. 12:400, 1953.

After the injection of antigen (Shigella paradysenteriae) into the feet of rabbits, cells teased from popliteal lymph nodes of these donor rabbits were transfused into fresh, noninjected rabbits. Specific agglutinins appeared in the sera of recipient animals in relation to varying time intervals between injection of donor and transfer of its lymph node cells. A detailed study of 14 cell types was made showing the reaction of each cell type at certain time intervals, after sensitization.

CYCLIC CHANGES IN HUMAN PLATELET MORPHOLOGY. A. R. Kelley, R. M. Sturrock and L. B. Gorski (introduced by F. W. Hartman), Fed. Proc. 12:393, 1953.

Utilizing an RCA electron microscope, a platelet enumeration and classification method was developed, thus facilitating studies of platelet morphology. This method is an extension of studies reported previously (Federation Proc. 2:419, 1952) with respect to the platelet effects of beta-propiolactone. Daily morphological changes were investigated in normal women over a 6 month period by classifying platelets according to 12 criteria based on size, density, filamentousness, cell margins and clumping. Simultaneous counts with the optical microscope were also made. Data were expressed both as the percentage of occurrence of the criteria with relation to the total count and as absolute numbers of platelets per cu mm of blood. Cyclic changes in numbers were demonstrated.

TISSUE TOXICITY OF BETA-PROPIOLACTONE AND ITS DEGRADATION PRODUCTS. F. W. Hartman and A. R. Kelly, Fed. Proc. 12:390, 1953.

With the present interest in B-propiolactone as one of the more promising chemicals for the inactivation of viruses in the presence of blood and plasma, its tissue toxicity and that of its degradation products as studied in the mouse, rabbit and dog are reviewed. B-propiolactone intravenously in the undegraded form produces marked generalized congestive necrosis of the liver parenchyma and degeneration of the tubules of the kidney in the rabbit and dog. B-Chlorpropionic acid in the mouse and dog produces a definite selective action on the lymphoid tissue. Hydracrylic acid shows no tissue toxicity in comparable doses. Blood and plasma treated with beta-propiolactone is injected only after degradation has occurred, hence only the degradation products have to be considered. These are in such relatively small amounts that little tissue reaction results as previously reported. (Supported by A. E. C. grant.)

EFFECTS OF GROWTH HORMONE AND TESTOSTERONE PROPIONATE ON RATES OF PROTEIN DEGRADATION AND PROTEIN LOSS. Paul D. Bartlett, Fed. Proc. 12:174, 1953.

Extension of studies on the mechanism of nitrogen storage (Federation Proc. 11:184, 1952) to include measurements of rates of protein degradation and protein loss in fasting adult female dogs and in such animals treated with anterior pituitary growth hormone or testosterone propionate form the basis of the present report.

CLINICAL EVALUATION OF A CONCENTRATED IODINE PREPARATION—FOR INTRAVENOUS NEPHROGRAPHY AND PYELOGRAPHY. A Waite Bohne and Wm. W. Christeson, Radiology 60:401, 1953.

In order to evaluate the use of 70 per cent Urokon Sodium for intravenous nephrography and pyelography, this medium was used for a series of 13 nephrograms and for 100 pyelographic studies. The pyelograms were compared with an equal number obtained with 30 per cent Urokon Sodium.

This concentrated iodine preparation is an excellent medium for nephrography and is superior to the 30 percent preparation in intravenous pyelography, in many instances eliminating the need for retrograde pyelograms.

Allergic reactions to this concentrated iodide may be kept to a minimum by the prophylactic administration of antihistaminic preparations.

RELATIONSHIPS OF THE FEMALE URETHRA AND BLADDER IN URINARY STRESS INCONTINENCE. C. P. Hodgkinson, Am. J. Obst. & Gynec. 65:560, 1953.

Through the employment of the metallic bead chain technique for urethrocystography, the relationships of the urethra and bladder were investigated. Undistorted urethral configuration was studied in relation to normal and disturbed bladder physiology.

This method of study of the relationships of the urethra and bladder demonstrates several advantages. The patients were studied in the standing position. Roentgen detail was clear in both the anteroposterior and lateral positions. Undistorted urethral configuration was obtained under conditions of rest and strain. The method was easy to learn and simple in application.

SELF-CALIBRATING PIPETTE FOR REMOTE COLLOIDAL Au^{198} TRANSFERS. L. E. Preuss, Nucleonics 11:66, 1953.

A self-calibrating pipette is described, useful in eliminating individual calibration before sterilization.

ABDOMINAL EXPLORATIONS—RESULTS DURING PELVIC OPERATIONS. Jean Paul Pratt, Obst. & Gynec. 1:364, 1953.

At the time of a pelvic operation a Gynecologist has the opportunity to explore the whole abdomen. Among the laparotomies performed 1112 were suitable

for exploration of the whole abdomen. Contraindications to exploration were infection, hemorrhage and Caesarian section. The review showed that 530 or 47+ per cent of the total number explored had some complication and 582 or 52+ per cent had no complication.

The appendix was removed from 633 patients or 57− per cent. The appendix had been removed previously from 389 patients or 35− per cent of all patients explored. Meckel's diverticulum was found four times. Regional enteritis involved the terminal ileum in 2 patients. One carcinoid or argentaffin tumor was found in the terminal ileum. The right half of the colon exhibits so many and wide variations that they do not lend themselves readily to statistical analysis. Embryologic rotation and descent of the colon may be arrested at several levels and numerous examples of this variability were noted. The gall bladder was found to be more frequently diseased than any of the other viscera. The findings were: chronic cholecystitis in 172 patients or 15+ per cent; gallstones in 115 patients or 10− per cent; adhesions in 48 patients of 4+ per cent and 1 cyst of the gall bladder wall. Inability to palpate stones was not proof that they were not present. The liver showed many variations in size and shape. The spleen varies so much in size that it is difficult to classify it as small, large or average. Adhesions were the most frequent lesion in this organ—20 patients or 1.8 per cent. Tubercles were found 4 times. Usually adhesions were found in spleen and liver in the same patients. In the kidney the most common abnormality was hydronephrosis which was found in 15 patients. Two polycystic kidneys and one solitary cyst were encountered. Congenital absence of one kidney was noted twice and in two patients one kidney had been previously removed. The mobility of the kidney varied widely and since there is no satisfactory standard of normal mobility this feature was not recorded.

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